The Carbon Footprint

Emerging Environmental Challenges for Sustainable Aviation



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Dr. Michael W. Tretheway InterVISTAS Consulting Inc.



Will Anyone Care?



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CAROLE JAMES IS SHE A PREMIER-IN-WAITING? 15

LA RESURREZIONE

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global warming, but will planting trees in Maple Ridge address the problem? By Ben Parfitt

Spiritual Messaging

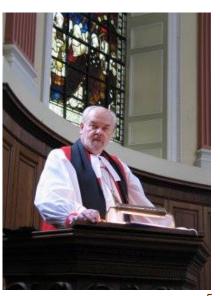
"Making selfish choices such as flying on holiday or buying a large car are a symptom of sin."

 "Sin is not just a restricted list of moral mistakes.

It is living a life turned in on itself where people ignore the consequences of their actions."

Richard Chartres
 Bishop of London







Sophisticated Messaging on Roads & Rail Routes to LHR

Coming Soon to North America



- Climate Change issue is not confined to Europe
 - North American attitudes are shifting rapidly
 - Aviation will be targeted

The Carbon Footprint



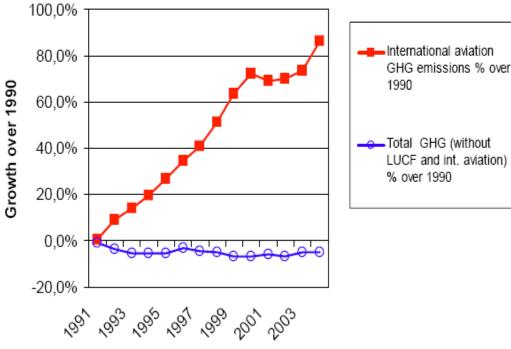
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Historic EU GHG Emissions

- EU GHGE grewby 87%(1990 and 2004)
- Emissions from other sectors declined.

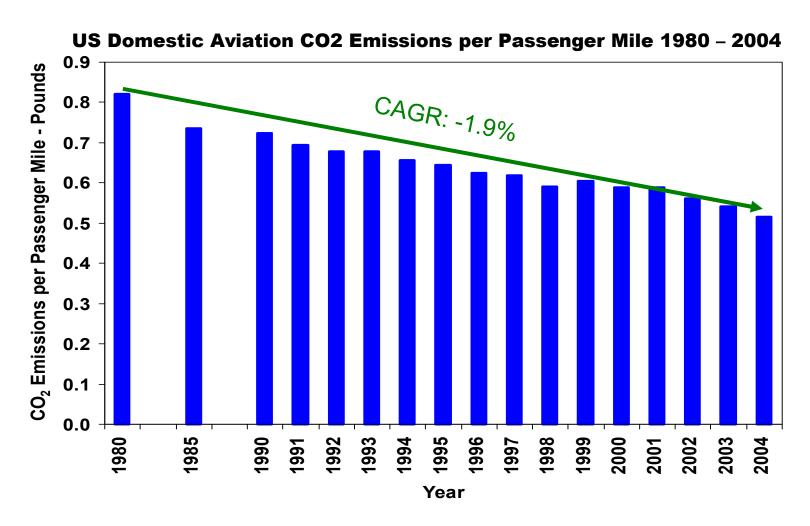
Development of EU-25 international aviation GHG emissions 100.0%



Source: Commission of the European Communities, Summary of the Impact Assessment: Inclusion of Aviation in the EU Greenhouse Gas Emissions Trading Scheme (EU ETS), December 2006.



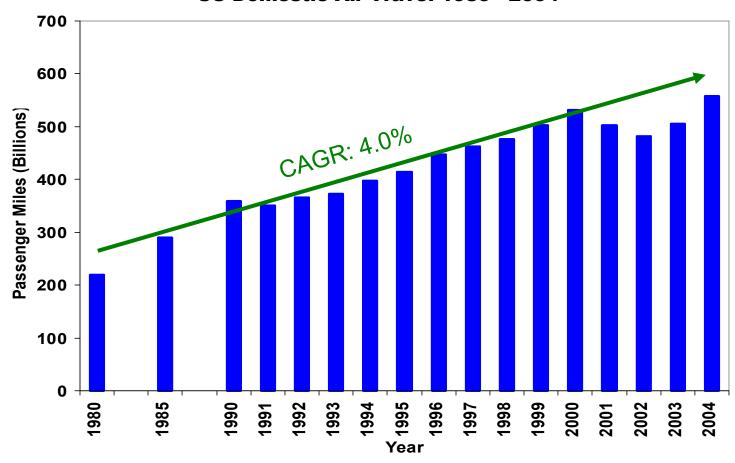
Some Good News – Efficiency Gains





However, Rapid Growth in Air Travel

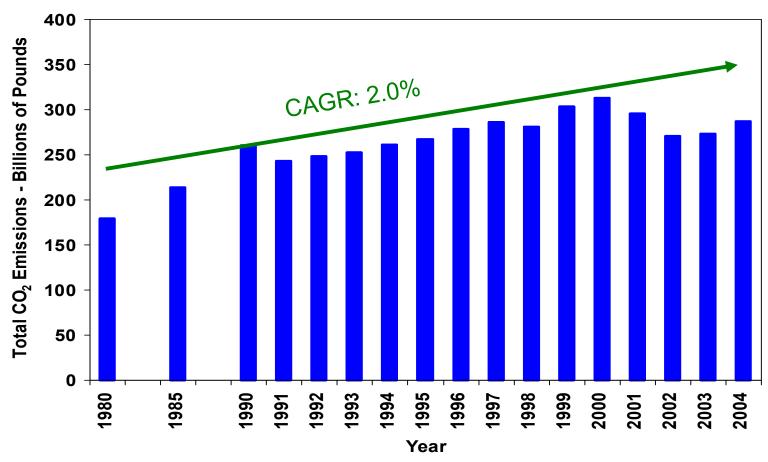






Total Emissions Continue to Climb...

US Domestic Aviation CO2 Emissions 1980 - 2004





How Does this Compare to Auto?

US CO2 Annualized Growth Rates 1980 - 2004

	Air Travel	Automobile /Motorcycle
Emissions per Passenger Mile	-1.9%	-0.9%
Passenger Miles	4.0%	1.2%
Total Emissions	2.0%	0.3%



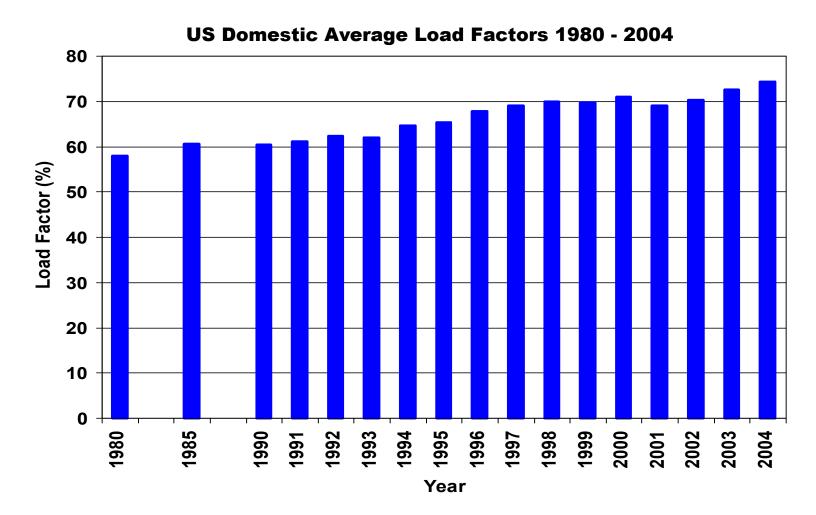
Technology is Not Enough

- A study by the Intergovernmental Panel on Climate Change (IPCC) concluded that
- "the increase in aviation emissions attributable to a growing demand for air travel would not be fully offset by reductions in emissions achieved through technological improvements alone"



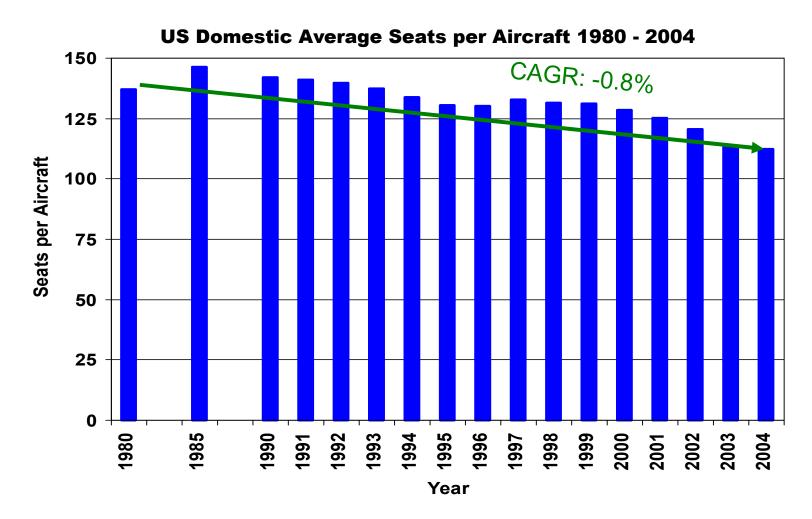
Source: US General Accounting Office, "Aviation and the Environment: Aviation's Effects on the Global Atmosphere Are Potentially Significant and Expected to Grow"

What About Increasing Load Factors?



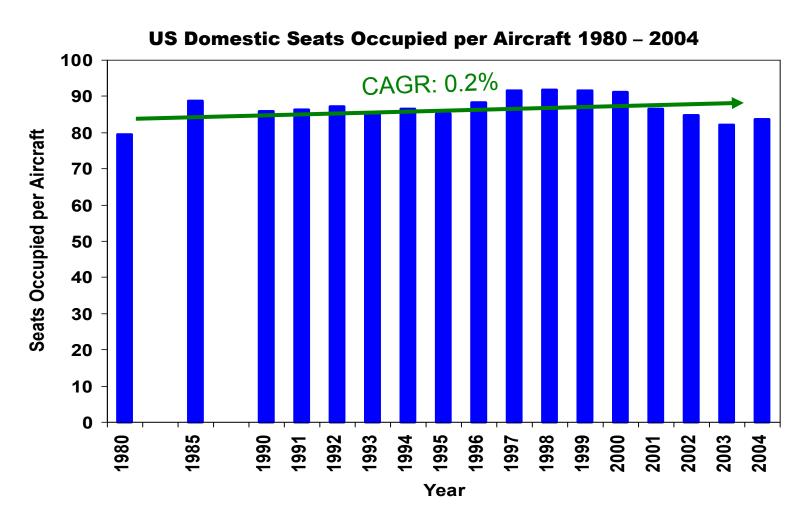


However, Decline in Average Number of Seats





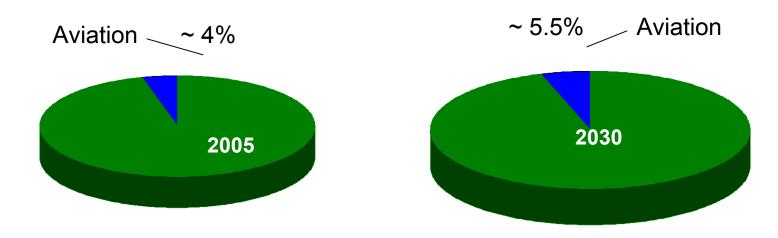
Minimal Effect on Average Number of Passengers per Aircraft...





The Future – A Larger Share of a Larger Pie

US CO2 Emissions 2005 vs. 2030





- Aviation emissions will increase 65% by 2030
- Total emissions will increase by 25% by 2030

Source: Energy Information Administration

Solutions



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Solutions

Do Nothing

- but public sentiment is changing
- there will be a political solution imposed on industry
- Carbon Tax
- Cap and Trade
- Voluntary Offsets



Carbon Tax

An economist's dream

- charge users what it would cost to offset carbon
- but no requirement to actually offset

Tax Revenues

- would generate substantial tax revenues
 - domestic aviation in Canada: \$120 million ?
- tax neutrality (e.g., BC)
 - reduce other taxes paid
 - but imposes burden on aviation
 - multiple jurisdictions may dually tax emissions

Carbon Tax

- Stable, known cost
 - cap and trade schemes
 - may have escalating or variable costs
 - may be based on erroneous calculations
- total payment varies with business cycle



Cap & Trade

Imposes limit on emissions

limit typically declines, in order to meet Kyoto targets

Administration

- Cap/quota imposed on an industry
- cap allocated to firms

If you cannot stay within quota

then you must buy quota from another firm in another sector



Cap & Trade

May raise cost of travel

- investment to achieve cap
 - although in many sectors, these investments are cost reducing
- purchase of quota

May be prone to error

- initial industry quota
- allocation of quota
- inequitable quota assignment
 - e.g., 'free' quota to new entrants
 - This will look like slots



Cap & Trade

- Strongly preferred by environmentalists
 - achieves actual reductions



Examples from the EU

Cap & Trade

 The EU plans to add aviation to its Emissions Trading Scheme (ETS) starting in 2011

Carbon Tax

- Starting in 2009, the UK is replacing air passenger duty with a "per flight" tax based on carbon emissions
- Note the double 'solution'



Voluntary Carbon Offsets

- CO2 emissions countered by financial contributions to:
 - Energy efficiency projects
 - Renewable energy projects
 - Tree planting (considered suspect offset)
- Voluntary offsets will mitigate negative economic impacts of GHGE reductions
 - Most price sensitive will not volunteer

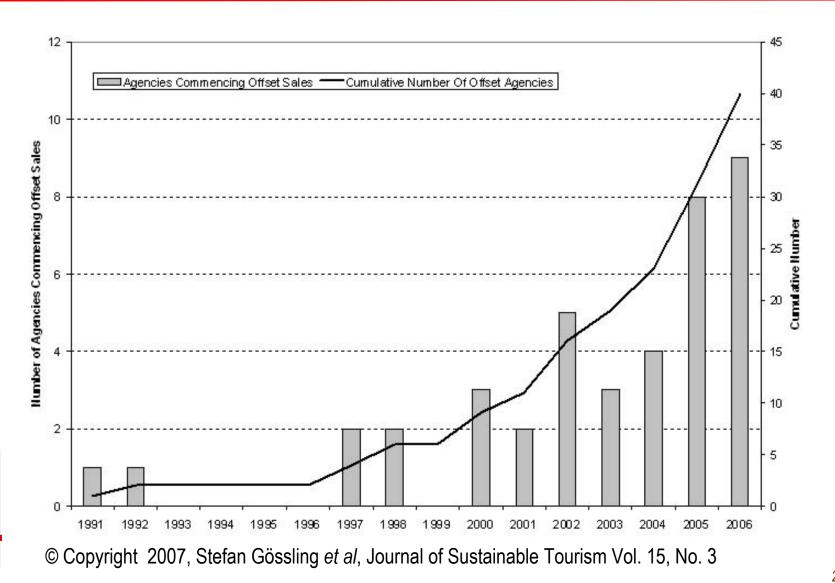


Carbon offsetting provides a viable "transition strategy"

until more permanent solutions are available

Carbon Offset Sales, 1991 to 2006

InterVISTAS



Price Impact on Air Travel

Less than you might think

- air travel is thought of as 'price elastic'
 - 10% price increase typically reduces travel by 13%
- but when price increase affects all routes, carriers, destinations and modes
 - air travel is observed to be price inelastic

InterVISTAS









The demand for air travel is sensitive to changes in air travel prices and incomes. However, the degree of sensitivity (i.e. its demand elasticity) will vary according to different situations. Reliable estimates for demand elasticities are essential in order to ensure that air transport policies are effective.

Price Impact

- When all carriers and modes affected
 - e.g., fuel cost increase or carbon tax
- Then 10% increase in fares reduces travel by only 6%

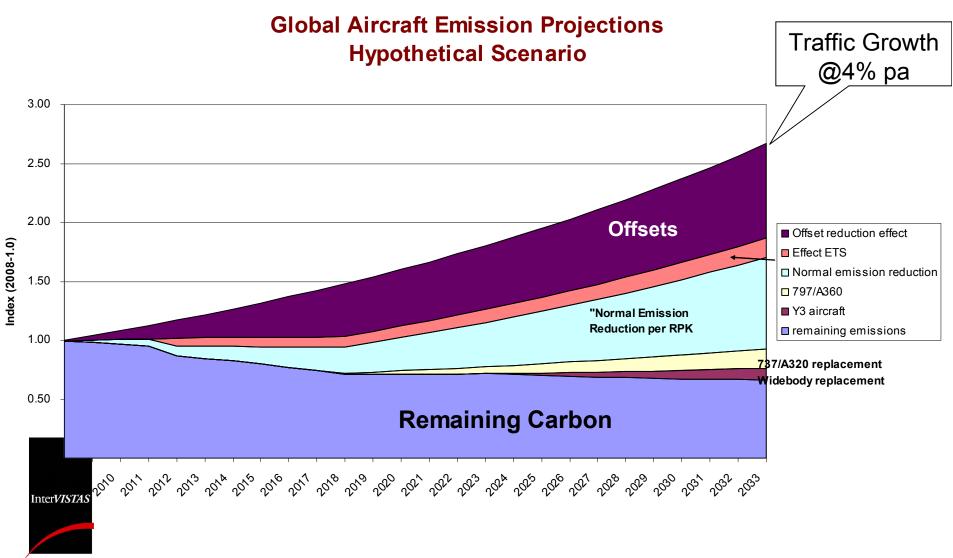


Forecasting Issues

- Carbon Impacts will have to be managed
 - Thus, a need to forecast carbon footprint
- Will need to project
 - Traffic movements by type of aircraft
 - Phase in of fleet replacement
 - And deployment of new technologies (737/A320 replacement in 2016?)



Carbon Forecast



Thank You



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